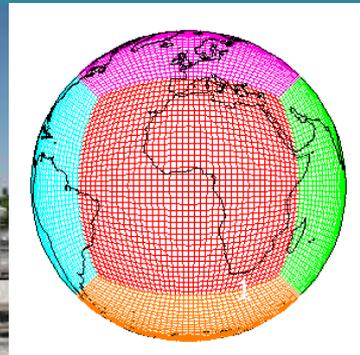


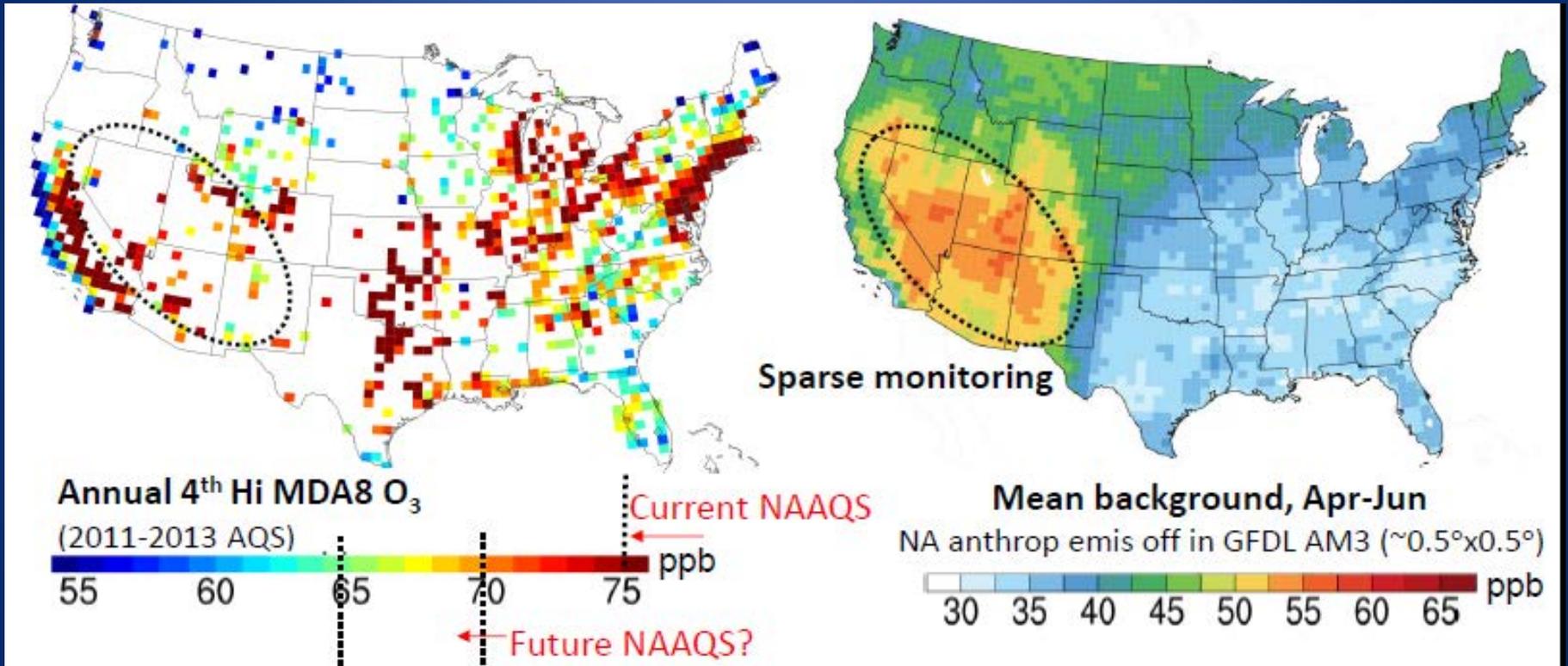
# California Baseline Ozone Transport Study (CABOTS)

ARB/RD



# Introduction:

## Challenges of Ozone Pollution Management in the Western US



*Lin, M., Transboundary Ozone Pollution Conference, April 2015*

# California's Unique Challenges

- Limited data to check the global models which provide our boundary conditions
- SJV and SoCAB are not high elevation which complicates modeling the impact of long range transported  $O_3$



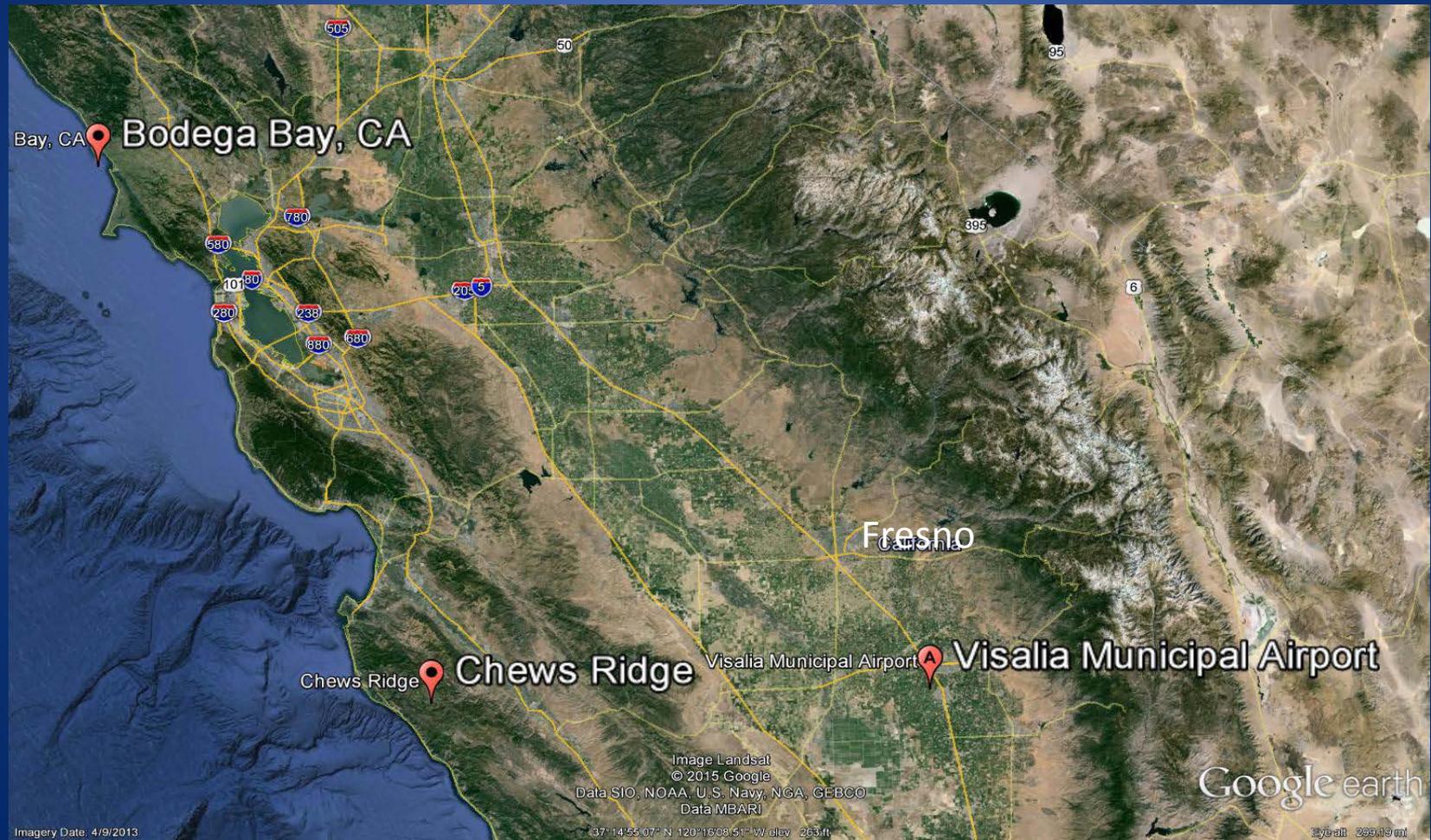
# Objectives of CABOTS

- Data to better understand how well global models reproduce the content and daily variability of ozone vertical profiles as they enter the State from the Pacific.
- Understand to what extent does trans-Pacific long-range transported ozone mix down to surface sites in the SJV and what is the impact.

# Key ARB Funded Projects

- Improved Understanding of the Magnitude of Trans-Pacific Long Range Transported Ozone Aloft at California's Coast
  - PI: Dr. Sen Chiao of the San Jose State University (SJSU)
  - This project funds ozonesonde launches from the UCD Bodega Marine Laboratory once a day for about 3 months during the spring and summer of 2016.
- Lidar Profiling of Ozone in the San Joaquin Valley
  - PIs: Drs. Andrew O. Langford and Christoph J. Senff of NOAA
  - This project will use a surface based ozone lidar to provide quasi-continuous ozone profiles up to 2 – 3 km above ground level in the SJV (Visalia Airport) for 3 weeks each in the spring (“transport season”) and summer (ozone season) of 2016.

# CABOTS Ozonesonde and Ozone Lidar Sites



# SJSU Ozonesondes

- Near daily ozonesondes mid-May – mid Aug.
- Team trained at NOAA
- Data available within hours for planning lidar operations
- Products:
  - Data to validate ARB's modeled boundary conditions
  - Link ozone aloft the next day at the lidar site



# Ozone Lidar at Visalia Airport

- Collocated with SJVAPCD wind profiler
- Deployments: May 29 – June 18 and July 18 – Aug 7
- 8 hours per day continuous ozone vertical profile
- O<sub>3</sub> monitor, T, p, RH, wind speed/dir
- Products:
  - Dynamic aloft O<sub>3</sub> data to track inputs to surface
  - NCAR, EPA, AQAST modelers interested



# Other Related Work

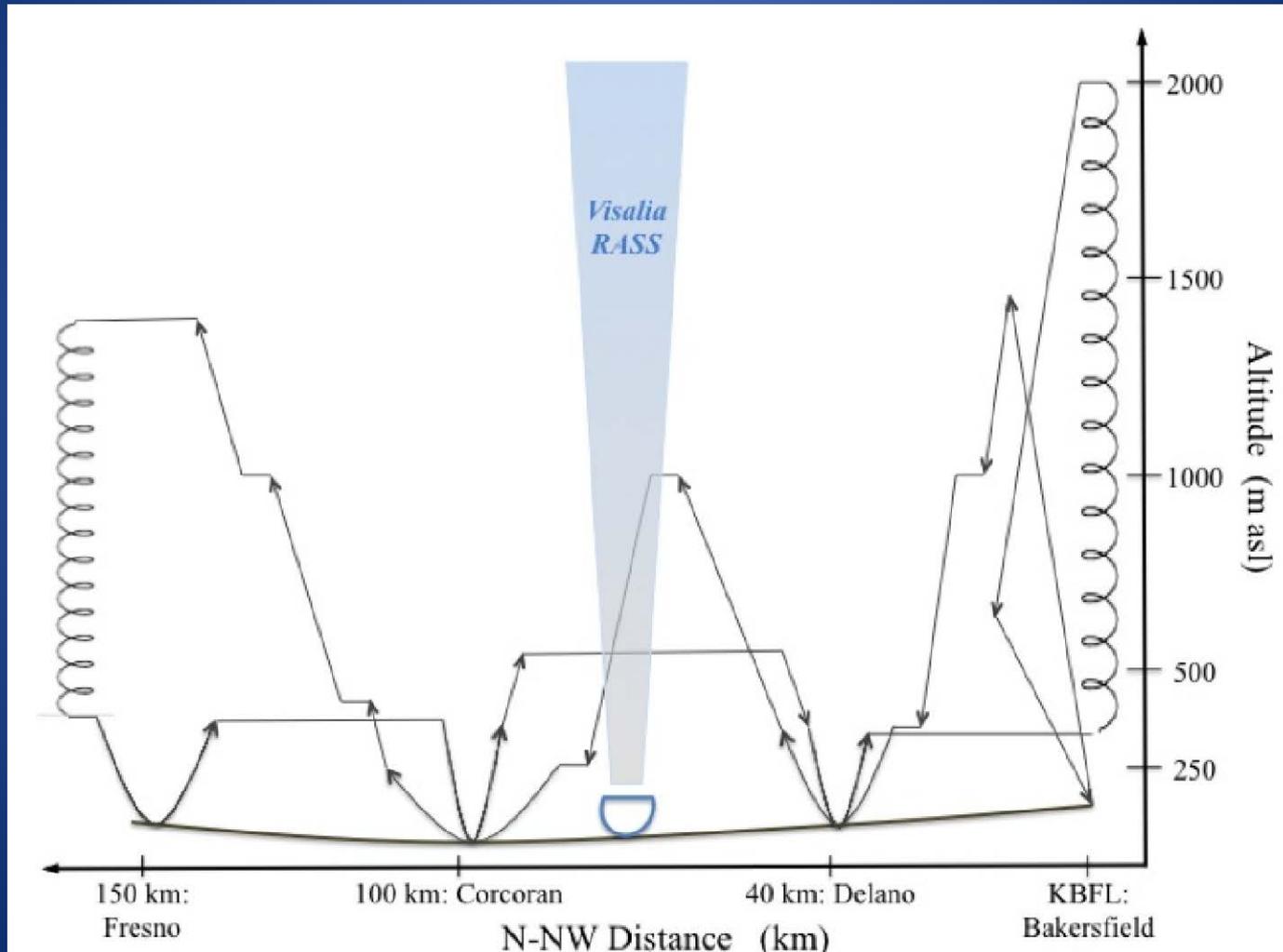
- Aircraft Measurements
  - ARB's Aircraft Pilot Observation (APOB) program.
  - Contract 14-308, "Ozone in the Lower Atmosphere and its Contribution to High Ozone Concentrations at Ground-Level in the Southern San Joaquin Valley"
  - NASA Ames Alpha Jet
  - NASA DC-8
- Surface Measurements
  - Bodega Bay and Visalia Airport
  - Summit of the Mammoth Mountain
  - Routine surface sites in the SJV and the Northern California coastal area
- Measurements at Chews Ridge, an elevated site in the Coastal Range
- Global and Regional Transport Modeling

# ARB's APOB

- Supports smoke management program
- Flights daily between 4 – 6 am over Fresno and Bakersfield, June through September
- Continuous measurements of ozone up to ~3000 m above ground.
- Variables measured included O<sub>3</sub>, temperature, pressure/altitude, latitude and longitude
- Data annually since 2008



# ARB Contract 14-308: Residual Layer O<sub>3</sub> & Mixing in SJV



# NASA Ames – AJAX Program

- Alpha Jet: range 1,200 miles, duration 2 hours
- Instruments:  $O_3$ ,  $CO_2$ ,  $CH_4$
- Met: P, T, turbulence index and 3-D wind vector
- Availability: 3 flights each in spring and summer.



# NASA DC-8



NASA Student Airborne Research Program (SARP) flights on June 17 and 18 in California

# Chews Ridge

- Ian Faloon, UCD
- Funded by SJVAPCD
- 20 km inland from Pt. Sur
- 1500 m agl
- Ozone relatively flat with no urban diurnal pattern

